
Hypertension Control Through the Design of Targeted Delivery Models

JOAN R. BLOOM, PhD

THE TRADITIONAL MODEL of medical care has been only partly successful in the prevention and control of chronic disease. New models for the delivery of services are needed. To create these requires reexamining and discarding many assumptions underlying the curative model of medical care. One such approach, a delivery system targeted for a high-risk population and designed for the control of hypertension, a major cause of disease, disability, and premature death in this country, is described in this paper.

Discarding the Myths

Before we can consider some of the criteria to be met in developing health delivery models for future decades, we must discard the mythology that has directed so much of our thinking. These beliefs are problematic insofar as they direct attention to a limited set of alternatives and preclude consideration of others. Three myths which form the basis of modern health care systems are (a) belief in the "magic bullet," (b) belief that the "captain of the team must direct traffic," and (c) belief that families must be treated together (avoidance of fragmented care). I contend that the obverse of these myths leads to the consideration of models that will be more effective in delivering services to prevent and control chronic disease.

□ *Dr. Bloom is assistant professor of health administration, University of California School of Public Health, Berkeley. The paper is a revision of one presented at the National Health Policy Issues Conference, held February 12-13, 1976, in San Francisco. Data on which the paper is based come from two projects at Stanford Research Institute, Menlo Park, Calif., one funded by grant No. R25-HL18424-01 (HEW) from the Division of Heart and Vascular Diseases, National Heart, Lung, and Blood Institute, Public Health Service, in 1975 and the other supported by SRI research and development funds.*

Tearsheet requests to Dr. Joan Bloom, School of Public Health, Earl Warren Hall, University of California, Berkeley, Calif. 94720.

The magic bullet. The American health care system is the product of the 20th century's technological revolution. For a long time, this system promised improved health and increased life through the reduction of cellular pathology. As the great scourges of the past fell one by one to the new technology of health, both providers and consumers began to believe that technology could provide a miraculous one-shot cure-all for every problem (1).

This belief was certainly the case in the treatment for hypertension, where the major emphasis, until a decade ago, was the detection of the curable secondary causes rather than treatment of primary or essential hypertension. Not until the late 1940s was a detailed prospective study of the natural history of hypertension initiated. This study's findings, corroborated by others (2-4), demonstrated that the level of blood pressure elevation is related to mortality and morbidity.

Past improvements in health have been the result of technological advances such as the development of vaccines, antibiotics, and sanitation. Important breakthroughs in the future will probably be made through controlling disease rather than curing it. But the myth lives on. Even as providers are being educated to consider that most diseases are chronic and need constant surveillance rather than one-shot cures, consumers are not. This phenomenon explains the status of hypertension control at the inception of the National High Blood Pressure Education Program in 1973—"the 1/2 by 1/2 by 1/2 problem"—one half of the victims do not know that they have high blood pressure; of the half that are aware of their problem, only half are under treatment; and of the half that are under treatment, only half are normotensive (5).

Directing traffic. Today, physicians account for about 8 percent of the 4.5 millions persons working in health services. The physician's position as captain of the team is rooted in history and preserved through law and social custom (6). Through more intensive and extended training, he or she is technically competent to deliver the magic bullet. The system that has been built around the physician has become increasingly more technologically complex.

However, high-intensity services designed for curing illness may not be necessary to control and prevent chronic disease. To consider this issue, we must look at both the nature of the disease and the nature of the system used to treat the disease.

When disease conditions are relatively stable and repetitive and exigencies are few, routines can be established to match these conditions. The screening and treatment of high blood pressure is repetitive and fairly stable, and few exigencies can occur. For these reasons, it was possible for the National High Blood Pressure Education Program (7) to establish recommendations and guidelines for both the screening and treatment of hypertension. Why is it then necessary for a physician (the captain of the team) to personally treat hypertension? If, in fact, every case of hypertension were detected, there would not be a sufficient number of physicians to do so. The use of physicians increases the intensity of care and, therefore, its cost and appears to be nonessential to providing effective treatment.

In the military, for example, most cases of hypertension are identified and followed by medical corpsmen. Only when a decision-making system for both screening and treatment has been unable to lower a person's blood pressure is he referred to the physician-specialist. Since 1973, Dr. Michael Alderman has been successfully using such a model in several department stores and municipal centers in New York City (8, 9). In this project, nurse-clinicians take histories, screen, and prescribe treatment for all employees who need it. If the patient does not respond to treatment, the nurse-clinician then consults a physician for further pharmacological advice. Persons whose blood pressure is still not lowered are then referred to specialists. The project was surprisingly effective—85 percent of the patients remained normotensive 1 year later. This proportion is far better than the current national assessment of 29 percent, a figure that is almost double the percentage of patients under control at the inception of the High Blood Pressure Education Program in 1973 (10, 11).

There are successful models for the treatment of chronic disease which do not have the "captain" on the front lines directing traffic; instead he is ready to be called in when high-intensity services are needed. Until we discard the myth that the physician should be on the front lines, models for delivery of health services will continue to be similar to the ones already available regardless of their degree of effectiveness.

Myth of the "family" doctor. A third commonly held belief that has shaped the design of the present

health care delivery system is that the entire family should receive its health care from the same source. While this belief is based on historical fact, it is becoming less true each year. Less than 35 percent of physicians are engaged in primary care, usually defined to include general practice, family medicine, general pediatrics, and general internal medicine. As the number of physicians has been increasing by 3 percent per year, the number engaged in primary care has decreased by 1 percent per year, owing primarily to retirement and death among those in general practice (12). The recent, increased emphasis in medical schools on family medicine has yet to make a significant impact on these figures.

Due to the increasing specialization of medicine, most family members have different physicians; the children may be seeing a pediatrician, the mother a gynecologist, and the father an internist. Often, none of these physicians is in contact with another and may, in fact, not know of the others' existence. Should any member of the family develop an additional health problem, he or she may be referred to yet another specialist. Further, it is likely that these providers will change every few years because of high mobility of the consumer and the increasing mobility of practitioners.

Yet, the myth of continuity of care between one provider and a family of consumers persists and has prevented the development of health services to family members as individual persons. In the past, recommendations for more health services for children at the school site or for workers at their place of employment have been rejected on the basis of fragmentation of care. Undoubtedly, the real reasons have always been economic, legitimized through the rubric of continuity of care. Discarding this last myth can aid in the development of effective delivery systems to prevent and control chronic disease.

Criteria for Delivery of Services

The problems associated with the delivery of services to control and prevent high blood pressure exemplify a far wider spectrum of problems than those of providing effective services for persons with chronic illnesses. Illustrations of specific problems associated with the detection and treatment of high blood pressure will be used to deduce a set of criteria necessary in building targeted models.

Complexity of hypertension. According to Task Force II of the National High Blood Pressure Program (5), "hypertension is the primary cause of 60,000 deaths each year and a contributing factor in

1,500,000 heart attacks and strokes that occur each year." The prognosis of essential or primary hypertension is variable; some persons remain asymptomatic for years, while others develop disabling or fatal complications. The therapeutic trials conducted by the Veterans Administration (13, 14) have demonstrated the efficacy of pharmacological treatment regardless of age and severity. In addition, in these trials it was ascertained that even mild degrees of hypertension were harmful if maintained over long periods. Unfortunately, persons with mild hypertension are less likely to see the need for treatment than those with more severe disease.

To add to this complexity, various segments of the population are susceptible for a number of reasons. Hypertension is familial. Females are more susceptible than males; however, males are less likely to stay in treatment. Although statistics suggest that blacks are twice as likely to develop hypertension as whites, it is unclear whether ethnicity is the more important factor, since blacks are also more likely to subsist at the poverty level. And, finally, persons living in urban areas are more susceptible than rural dwellers. The sociodemographic characteristics of the disease increase the difficulties of control. If the disease is so complex, can we expect to find a single solution effective for all its aspects?

The National High Blood Pressure Education Program identified four significant gaps in the control process:

1. Detection,
2. Referral to care,
3. Selection of appropriate therapy or surveillance, or both, and
4. Long-term maintenance of therapy.

Problems in detection and referral to care. Associated with detection are the twin problems posed by the technical difficulty of the screening and by the difficulty of getting people in a sequential screening procedure. Most studies have used a single casual blood pressure measurement in defining the hypertensive population and in measuring degree of control. It is common knowledge, however, that if a casual blood pressure measurement is taken more than once on the same occasion, the results will differ. It has also been shown that the variability of blood pressure across occasions is greater than the average of pressures taken in close succession. Continuously monitored blood pressures are lower than the average of casual blood pressures (15-17). Thus, misdiagnoses will be frequent when a single, casual blood pressure measurement is used as the criterion.

The direction of the error will be an exaggeration, perhaps as high as one-third, in the prevalence of hypertension. In addition, there is an increased possibility of attributing differences between measurements either to treatment efficacy or to lack of adherence to a prescribed regimen rather than to measurement error. The implications of these findings are considered in the guidelines of the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure (7); they recommend primary screening and secondary screening on different occasions.

One difficulty of a large screening effort is a poor response rate. For example, Verduca (18) notes that only 35 percent of the employees at Western Electric in New York City participated in a voluntary screening program although all employees were invited. Charman (19) attempted to deal with the nonresponders' problem by providing prescreening education. All employees of two industrial organizations in New England were notified by letter of the time and date of screening. Fifty-five percent reported for the screening. Nonresponders were contacted by telephone; this step increased the response rate by another 13 percent.

Another problem of screening is the difficulty of getting persons with elevated blood pressure readings on the primary screening to return for a second screening. This task is more difficult if the primary screening was done in a grocery store (20) or a fire department (21), sites which may be outside an individual's usual routine, and less difficult in a dental office (22), an industrial setting (23), or at the site of a community research project (24).

Use of a sequential screening procedure decreases misdiagnoses; thus, the legitimacy of the screening effort is enhanced in the eyes of the patient as well as the provider. Without such legitimacy, the screening will not receive the support of the community. Even when the diagnosis is increased risk of hypertension, drug therapy is not inevitable. For the largest group of hypertensive patients, those with borderline or mild hypertension (readings of 140-160/90-100 Hg), the National High Blood Pressure Education Program does not recommend a drug regimen. Since risk of further blood pressure elevation exists, this group should enter a surveillance program. What often happens, instead, is that the person drops out—only to be detected again and again in other screening programs.

For the patient to remain active in a surveillance program, the initial interactions between provider and patient are probably critical. Education for both

provider and patient may be required. Task Force II (5) identified the essential elements of provider education. In addition to formal programs, self-study programs like the one offered free by Smith, Kline, and French are available (25). At the Stanford Research Institute, educational materials for patients during this critical control period are being pilot-tested. The materials provide information about the avoidable risks of high blood pressure, the patient's responsibility, and potential problems of adjustment to treatment. The objective is to motivate continuing treatment through anticipatory guidance.

The weak link in most programs is the loss of patients from one institution to another at referral. According to Wilber and Barrow, patient follow-through is probably lessened for a number of reasons: lack of symptoms, feeling well, and lack of perceived importance (20). For example, in their study of an urban, middle-class population screened in shopping centers and on the street, 50 percent of those sent letters of referral had not seen a physician 3 to 6 months later. These proportions do not differ significantly from the results of other studies (18, 19, 23). Persons who drop out before entering the medical care system present a considerable problem for those planning a followup program.

An approach that appears to have met with considerable success is the provision of followup at the site of screening (8). In a rural community in Georgia, Wilber was able to recruit 85 percent of a volunteer sample for followup (24). He attributed his success to the visits a public health nurse made to each person. Personal followups at the screening site and through outreach appear to be useful strategies in a control program.

To be cost effective, the choice of strategies entails thoughtful planning to determine the target population and the most efficient method to reach it. For example, provision of care at the worksite is bound to fail if the target population is unemployed, while the opposite is true if public health nurses are doing the followup.

Selection of appropriate therapy or surveillance. Once the patient enters the medical care system, other issues emerge. The provider may not corroborate the referral diagnosis, may feel that only surveillance is required, or may recommend drug therapy.

Selection of appropriate therapy is often an incremental process and, as described by Task Force I (7), careful administration and monitoring of medication necessitates close collaboration between the patient and provider. This therapeutic alliance eases

problems such as drug side effects, often associated with the selection of the appropriate regimen, as well as lack of patient adherence.

Long term maintenance of therapy. The study by Caldwell and associates (26) indicates that postentry dropout is related to tenure in the system; the longer a person has been under care, the more likely he or she will remain under care. Using retrospective data, Caldwell and associates plotted the loss of persons from treatment over 64 months. By the end of 5 years, almost three-quarters of the patients had dropped out of treatment, but almost 50 percent of the dropout rate occurred within the first 6 months. While staying under care is only one dimension of the control problem, it is probable that, if patients do not stay under care, they are also not following their medical regimens. The most critical gauge of their control is still their blood pressure, which brings us back full circle to the importance of getting patients into a system where blood pressure measurements can be taken on successive occasions.

The success of two kinds of followup were noted: the provision of treatment in the workplace, which is also the site of screening, and personal followup in the community by a public health nurse. It is interesting to note the adherence for each type of program. According to Alderman and Schoenbaum (8), 85 percent of the patients beginning treatment were still under care 1 year later. The community outreach program designed by Wilber and Barrow (20) was equally successful, although the number of patients under surveillance decreased sharply when the funding of the community followup program ended.

In both successful models, care was provided not by a physician but by another member of the health team, a nurse. In other words, high-intensity care by a physician is neither necessary nor a sufficient criterion for success.

From these two models—the community outreach effort and the effort at the workplace—we can deduce a set of general criteria that may be useful in developing still other models:

- Each was targeted for a specific subgroup susceptible to the problem.
- Each allowed for multiple measurements of blood pressure during both detection and treatment.
- Each provided continuity between the detection site and the site where treatment was available.
- Each had an essentially closed system where persons could be tracked individually.

- Each provided followup treatment by a member rather than the captain of the health team.
- Each, being disease-specific, was essentially fragmenting care, albeit creatively, by specializing in a specific treatment package for a specific family member at a specific geographic site.

Building Targeted Models

The strategy for building targeted models that I suggest assumes the selection of a geographic area, for example, a health service area. It also assumes that the designers have a great deal of knowledge about the population living in the area.

Selecting and mapping a community. In the selection of a community for a hypertension program, knowledge of the sociodemographics as well as knowledge of the natural history of the disease and its treatment are essential. For example, suppose that the community selected for a hypertension control program is a densely populated urban area with a large minority population and a number of medium-sized industries. The group at highest risk of developing hypertension is urban black men. In addition, they are at highest risk for nonadherence to treatment.

Planners need to assess the sociodemographic characteristics of large groups of populations; for example, how many are employed in large industries? The plants are a potential site for screening. How many are unemployed and receive unemployment insurance? The unemployment office is a potential site for screening and treatment. How many can be reached if a community worker or other member of the health team made home visits? From these data, targets for the delivery model can be chosen.

Setting goals. What goals are reasonable for a hypertension program? To set goals, it is important to separate those for a particular geographic area from those for a nationwide program.

What proportion of hypertension in the population is undetected, untreated, or undertreated? To set goals for a specific project, it is important to know in advance the numbers of people who can be reached through these target programs. Assuming the goal of a particular model is to increase the proportion of controlled hypertension within the target population, these estimates are useful in both the setting of goals and in gauging the effectiveness of the project.

There are at least two kinds of goals for a nationwide hypertension program. First, a goal can be the

number of people whose hypertension is controlled—the ultimate measure of effectiveness. Alternatively, a goal can be the number of new programs initiated as the result of the control efforts. Since there is an implicit assumption bridging these two goals—that the latter is causally related to the former—goals probably should be stated in terms of both numbers.

Implementing the program. What problems can be foreseen in implementing the program? Can incentives be built into the delivery model that will increase its attractiveness to the intended clientele as well as to the funding source? Responding properly to these questions will increase the probability of getting the program accepted and implemented.

There are built-in potential incentives if the workplace is targeted as a delivery model. Once labor and management have agreed on having a health program such as hypertension control as part of the benefit package, they have a great commonality of interest. They become united in a common objective of obtaining the best program possible. In addition, there has been growing concern among management that many of the benefits given employees are intangible and not perceived as of equal value to an increase in salary. Health care services, such as a hypertension control program, are highly visible and therefore are a tangible benefit. Noting these positive features, the High Blood Pressure Education Program has recently selected the worksite as one focus for therapy maintenance.

Program effectiveness. In addition to assessing progress toward goals through knowledge of the proportions of population whose hypertension is under control, two other methods are suggested in evaluating the effectiveness of a hypertension control program. The first is tracking people who have been identified in the program through a hypertension registry, similar to the tumor registry used in cancer control. The long-term effectiveness of hypertension control can then be determined through registry data. A second suggested method is determination of the cost effectiveness of the various targeted models. Tailoring the intervention to the population chosen in a targeted delivery model is expected to increase the cost effectiveness of a hypertension control program.

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SYNOPSIS

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If we discard some of the assumptions upon which curatively oriented medical care is based, we can design models to deliver more effective services for those with chronic diseases. Assumptions to be discarded are—

- that disease processes can be cured through the delivery of a "magic bullet" rather than controlled

through continuous surveillance,

- that the physician must be an active decision maker and thus act as gatekeeper and monitor for all disease victims, and
- that care for a family of consumers must be provided together.

Models for the delivery of services can then be designed to provide continuity of care for those with a specific chronic disease, and paraprofessionals can be used as gatekeepers and monitors, in combination with physicians, rather than physicians alone, to give services. Models can be targeted to reach specific high-

risk groups within the population at the workplace, the school, unemployment office, or wherever groups routinely congregate for purposes other than health care.

Building targeted models requires extensive knowledge of the specific geographic area and its population as well as knowledge of the natural history of the disease and its treatment. For hypertension programs, goals can be set in terms of numbers of persons whose disease is controlled and the number of new programs initiated as the result of the control efforts.